

CHAPTER 9.4 (USARAL)

MAINTENANCE OF HERCULES USARAL LAUNCHING SECTION MODIFICATION KIT

Section I. GENERAL

194.84. Scope

This chapter contains DS & GS maintenance information covering the HERCULES USARAL launching section modification kit. The scope of DS & GS maintenance is determined by the listing of DS & GS maintenance parts in TM 9-1440-250-25P/1/1 and the listing of special tools for DS & GS maintenance personnel in the Department of the Army Supply Catalog 4935-92-CL-011.

194.85. References

Organizational maintenance of the HERCULES USARAL launching section modification kit is covered in TM 9-1440-250-20/1. Schematic diagrams are furnished in TM 9-1440-250-20/2, and wiring diagrams are provided in TM 9-1440-250-35/1. General maintenance procedures are provided in TM 9-1400-250-15/3. Additional general maintenance procedures applicable to performing maintenance on the HERCULES USARAL launching section modification kit are provided in chapter 4. It is especially important that personnel become familiar with the contents of chapter 4 and TM 9-1400-250-15/3. No references to general maintenance procedures are provided in this chapter.

194.86. General Precautions

When performing maintenance on the hydraulic or electrical portions of the Hercules USARAL launching section modification kit, the precautions described in *a* and *b* below must be observed.

a. Hydraulic precautions.

Warning: Hydraulic fluid is flammable. Precautions should be taken to prevent spillage. Fire protection measures should be employed.

- (1) Open SYSTEM BLEED globe valve (1, fig. 10.1).
- (2) Relieve pressure in accumulator by removing cap (4A, fig. 10.1) from pneumatic tank valve (4, fig. 10.1) and turning swivel nut (4, fig. 10.1) 1/4 turn counterclockwise, and depressing valve core (4C, fig. 10.1).
- (3) Cap all open lines to prevent contamination of the system.

b. Electrical precautions.

- (1) Observe the precautions in (a) through (d) below when performing maintenance on the cable assemblies of Hercules monorail launcher assemblies No. 1, No. 2, No. 3, and No. 4.
 - (a) Set the MAIN PWR BRKR on power distribution box of launcher No. 1, No. 2, No. 3, or No. 4 to OFF.
 - (b) Deenergize launching section rotary converter.
 - (c) Disconnect power cable from J1K, J1L, J1M, and J1N receptacle connectors (P, Q, R, and S, fig. 279) on the Hercules section simulator group and cap receptacles.
 - (d) Energize launching section rotary converter if power is required for other equipment.
- (2) Observe the precautions in (a) through (d) below when performing maintenance on the test station hy-

draulic pumping unit (2, fig. 10.1), circuit breaker box (5, fig. 10.1), and associated cable assemblies.

- (a) Set the MOTOR POWER switch (4, fig. 10.2) on the circuit breaker box to OFF.
- (b) Deenergize launching section rotary converter.

- (c) Disconnect power cables connected to receptacle connectors (2 and 3, fig. 289.26) on the three-way junction box (5, fig. 289.26), and cap receptacles.

- (d) Energize launching section rotary converter if power is required for other equipment.

Section II. MAINTENANCE OF HERCULES USARAL LAUNCHING SECTION MODIFICATION KIT HYDRAULIC SYSTEM

194.87. General

This section provides the procedures for performing maintenance on the hydraulic system of the Hercules USARAL launching section modification kit. The maintenance procedures provided describe the removal, disassembly, assembly, and installation of the test station hydraulic pumping unit, clamps, valve assemblies, and fittings of the hydraulic network. The precautions described in paragraph 194.86 must be observed when performing any maintenance on these items.

194.88. Loading Rack Clamp Assembly

Note. The key numbers shown in parentheses in this paragraph refer to figure 289.19.

There are 14 loading rack clamp assemblies (1). These clamp assemblies support the hydraulic lines and the electrical cable assemblies. The procedures described in *a* through *d* below are typical for the removal, disassembly, assembly, and installation of the loading rack clamp assemblies (1).

a. Removal.

- (1) Loosen rod end clevis (1a) and release retainer assemblies (1b and 1c).

1—Loading rack clamp assembly

a—Rod end clevis

b—Retainer assembly

c—Retainer assembly

d—3/8-16 wingnut

2—Test station valve assembly

a—Rod end clevis

b—Retainer assembly

c—3/8-16 wingnut

3—Tube cap

4—Tube nipple

5—Tube coupling nut

6—Tube reducer

7—Tube tee

8—Tube elbow

9—Tube nipple

10—Tube cap

11—Cable assembly

12—Tube assembly 9032304

13—Tube assembly 9032306

Figure 289.19. HERCULES USARAL launching section modification kit hydraulic system—removal and installation—legend.

- (2) Loosen wingnut (1d) and remove clamp assembly (1).

- b. Disassembly* (fig. 264). Disassemble clamp assembly.

- c. Assembly* (fig. 264).

- (1) Install two rod end clevises.

- (2) Install two retainer assemblies.

Note. Retainer assemblies and clevises must be free to rotate after assembly.

- d. Installation.*

- (1) Install loading rack clamp assembly (1).

- (2) Secure retainer assemblies (1b and 1c).

194.89. Test Station Valve Assembly

There are 12 test station valve assemblies (2, fig. 289.19) located in the missile storage chamber. Each valve assembly (fig. 267) consists of a globe valve, two tube tees, two rubber hose assemblies joined at one end by a quick-disconnect coupling assembly, and a loading rack clamp assembly to install the valve assembly. The procedures described in *a* through *d* below are typical for the removal, disassembly, assembly, and installation of a test station valve assembly.

Note. The key numbers shown in parentheses in *a* and *b* below refer to figure 289.19 unless otherwise indicated.

a. Removal.

- (1) Perform the hydraulic precautions described in paragraph 194.86a.
- (2) Place a container underneath test station valve assembly (2) to be removed, to catch hydraulic fluid that drips from lines.
- (3) Disconnect and cap the hydraulic lines. Remove tube caps (3, view A), as required.
- (4) Loosen rod end clevis (2a) and release retainer assembly (2b).
- (5) Release electrical cable assemblies.
- (6) Loosen wingnut (2c) and remove valve assembly (2).

b. Disassembly.

- (1) Remove rubber hose assemblies (fig. 267) and cap open couplings.
- (2) Disassemble remaining parts of valve assembly (fig. 267).
- (3) Disassemble loading rack clamp assembly (fig. 264).

c. Assembly.

- (1) Assemble loading rack clamp assembly (fig. 264).
- (2) Position and secure tube tees (fig. 267) on loading rack clamp assembly.
- (3) Install globe valve.
- (4) Install rubber hose assemblies and all remaining parts.

d. Installation.

- (1) Position test station valve assembly (2) and install by securing 3/8-16 wingnut (2c).
- (2) Connect attaching tube assemblies or tube caps (3, view A) and torque coupling nuts or caps (3, view A) to 300 pound-inches.
- (3) Secure retainer assembly (2b).
- (4) Perform hydraulic test station air bleed procedures as described in TM 9-1440-250-20/1.

194.90. Hydraulic Network Tube Fittings and Hose Assemblies

Note. The key numbers shown in parentheses in this paragraph refer to figure 298.19, unless otherwise indicated.

The procedures described in *a* and *b* below are typical for the removal and installation of the tube elbows (8), tube nipples (4 and 9),

tube caps (3 and 10), tube tees (7), and tube reducers (6).

a. Removal.

- (1) Perform the hydraulic precautions described in paragraph 194.86a.
- (2) Place a container underneath tube elbow (8), tube nipple (4 or 9), tube cap (3 or 10), tube tee (7), or tube reducer (6) to be removed.
- (3) Disconnect attaching tube assemblies.
- (4) Remove elbow (8), nipple (4 or 9), cap (3 or 10), tee (7), or reducer (6), and cap open lines.

b. Installation.

- (1) Install tube elbow (8), tube nipple (4 or 9), tube cap (3 or 10), tube tee (7), or tube reducer (6); torque coupling nuts to 300 pound-inches.
- (2) Perform the launcher hydraulic system air bleed procedure as described in TM 9-1440-250-20/1.

194.91. Test Station Hydraulic Pumping Unit

There is one test station hydraulic pumping unit (2, fig. 10.1) in the missile storage room. Removal and installation procedures are described in *a* and *b* below. For disassembly and assembly of this unit refer to TM 9-5017-5.

Note. The key numbers shown in parentheses in this paragraph refer to figure 289.19 unless otherwise indicated.

a. Removal.

- (1) Perform the hydraulic precautions described in paragraph 194.86a.
- (2) Remove cable assembly (11, view E).
- (3) Remove tube assemblies (12 and 13, view E) and cap open lines.

b. Installation.

- (1) Install tube assemblies (12 and 13, view E); torque coupling nuts to 300 pound-inches.
- (2) Install cable assembly (11, view E).
- (3) Perform hydraulic test station air bleed procedures as described in TM 9-1440-250-20/1.

Section III. MAINTENANCE OF HERCULES USARAL LAUNCHING SECTION MODIFICATION KIT ELECTRICAL SYSTEM

194.92. General

a. This section describes the maintenance of cable assemblies and loudspeakers, and the components and hardware items that support their installation.

b. When replacing any cable assembly (fig. 289.20) that is routed through a conduit containing more than one cable assembly, it may be necessary to remove all of the cable assemblies in that conduit. The size of the affected cable, the cable connector, and the conduit, will determine whether only the affected cable assembly can be removed and replaced. To facilitate the installation of cable assemblies through a conduit, a pullthrough line (fig. 84) is tied to the end of the cable assemblies being removed. The pullthrough line is pulled into the conduit as the cable assemblies are removed. The pullthrough line is then tied to the end of the replacement cable assembly or assemblies and pulled through the conduit.

c. The precautions described in paragraph 194.86 must be observed when performing maintenance on these items.

194.93. Cable Assemblies—Launcher Control-Indicators No. 1 and 2 to Hercules Monorail Launcher Assemblies No. 1 and 2

Note. The key numbers shown in parentheses in *a* and *d* below refer to figure 289.20, unless otherwise indicated.

Cable assemblies (11, 12, and 13) extend from launcher control-indicator No. 1 (27) through tunnel (20) to the power distribution box assembly and launcher base assembly of Hercules monorail launcher assembly No. 1 (15). An additional set of cable assemblies (11, 12, and 13) extend from launcher control-indicator No. 2 (34) through tunnel (37) to the power distribution box assembly and the launcher base assembly of Hercules monorail launcher assembly No. 2 (33). Typical removal and installation procedures for these cable assemblies are described in *a* and *b* below.

Warning: Before disconnecting or connecting any external power cables, deenergize the launching section rotary converter. Voltages DANGEROUS

- 1—Launching building
- 2—Hercules monorail launcher assembly No. 4
- 3—Conduit
- 4—Cable assembly 9032540
- 5—Cable assembly—9032541
- 6—Cable assembly 9032542
- 7—Loudspeaker with cable assembly
- 8—Side truss
- 9—Hercules monorail launcher assembly No. 3
- 10—Handhole
- 11—Cable assembly 9032007
- 12—Cable assembly 9031257
- 13—Cable assembly 9032033
- 14—Cable assembly 9031196
- 15—Hercules monorail launcher assembly No. 1
- 16—Launcher control-indicator No. 3
- 17—Cable trench
- 18—Cable access
- 19—Control cable carrier
- 20—Tunnel
- 21—Cable assembly 9032539
- 22—Cable assembly 9032037
- 23—Interlock junction box
- 24—Basement
- 25—Vertical conduit
- 26—Permanent magnet loudspeaker assembly
- 27—Launcher control-indicator No. 1
- 28—Cable assembly—9032743

- 29—Test station hydraulic pumping unit
- 30—Circuit breaker box
- 31—Cable assembly 9031705
- 32—Cable assembly—9032704
- 33—Hercules monorail launcher assembly No. 2
- 34—Launcher control-indicator No. 2
- 35—Cable trough
- 36—Cable assembly 9032568
- 37—Tunnel
- 38—400-cps rotary converter
- 39—Cable duct
- 40—Hercules launching section control-indicator
- 41—Hercules section simulator group
- 42—Three-way junction box
- 43—Section control room
- 44—Launcher control-indicator No. 4
- 45—Missile storage room
- *46—Screw
- *47—Trench cover plate
- *48—Bolt (8)
- *49—Handhole cover (2)
- 50—Handhole
- 51—No. 10-24 x 5/8 round-head screw
- 52—No. 10 flat washer (6)
- 53—Retaining strap (4)
- 54—Expansion shield (6)

*Furnished and installed by Corps of Engineers.

Figure 289.20. HERCULES USARAL launching section—
cable assembly locations—legend.

TO LIFE are present when the launching section rotary converter is in operation.

a. Removal.

- (1) Place launcher assembly No. 1 or No. 2 (15 or 33) in the firing position (out and locked).
- (2) Deenergize launching section rotary converter.
- (3) Disconnect cable assembly (11, 12, or 13) or assemblies from receptacle connector (C, D, or E, fig. 270) on launcher control-indicator.
- (4) Remove trench cover plates (47) from the cable trench (17), as required.
- (5) Remove cable assembly (11, 12, or 13) or assemblies from trench (17), through cable access (18).
- (6) Remove cable assembly (11, 12, or 13) or assemblies from cable trough (35) leading to control cable carrier (19).
- (7) Remove cable clamps (3, view B, fig. 289.21) and cable saddle support (4, fig. 289.21) from cable assemblies (11, 12, and 13).
- (8) Remove cable assembly (11, 12, or 13) or assemblies from control cable carriers (5, fig. 289.21).
- (9) Remove cover plate (7, fig. 289.21) from carriage fin (13, fig. 289.21) on missile launcher carriage (14, fig. 289.21).
- (10) Remove woven cable grips (12, fig. 289.21), as required, from cable assembly (11, 12, or 13) or assemblies.
- (11) Disconnect cable (11, 12, or 13) or assemblies from receptacle connector (C or D, fig. 271) on power distribution box assembly, or receptacle connector (F, fig. 271) on launcher base assembly.
- (12) Feed cable assembly (11, 12, or 13) or assemblies through carriage fin (13, fig. 289.21) in to tunnel.

b. Installation.

- (1) Connect cable assembly (11, 12, or 13) or assemblies to J69C or J69B

receptacle connector (C or D, fig. 271) on power distribution box assembly, or J81A receptacle connector (F, fig. 271) on launcher base assembly.

- (2) Feed opposite end of cable assembly (11, 12, or 13) or assemblies through carriage fin (13, fig. 289.21) on missile launcher carriage (14, fig. 289.21).
 - (3) Wrap exposed portion of cable assembly (11, 12, or 13) or assemblies between receptacle connectors J69C, J69B, and J81A (C, D, and F, fig. 271) and carriage fin (13, fig. 289.21) with asbestos insulation tape and wire as described in paragraph 38c.
 - (4) Install cable assembly (11, 12, or 13) or assemblies in woven cable grips (12, fig. 289.21), as required.
- Note.* Cable assembly (11, 12, or 13) or assemblies must be installed in the woven cable grips (12, fig. 289.21) to relieve any strain between receptacle connectors (C, D, and F, fig. 271) and the cable grip (12, fig. 289.21).
- (5) Install cover plate (7, fig. 289.21) on carriage fin (13, fig. 289.21).
 - (6) Position cable assembly (11, 12, or 13), or assemblies on control cable carriers (5, fig. 289.21) as required.
 - (7) Install cable clamps (3, fig. 289.21) and cable saddle support (4, fig. 289.21) on cable assemblies (11, 12, and 13).
 - (8) Position cable assembly (11, 12, or 13) or assemblies in cable trough (35) leading from control cable carrier (19) to cable access (18) adjacent to launcher control-indicator.
 - (9) Feed cable assembly (11, 12, or 13) or assemblies through cable access (18) into cable trench (17).
 - (10) Connect cable assembly (11, 12, or 13) or assemblies to J81B, J69A, or J69D receptacle connector (C, D, or E, fig. 270) on launcher control-indicator.

- (11) Install trench cover plates (47) on cable trench (17) as required.

194.94. Cable Assemblies—Launcher Control-Indicators No. 1 and No. 4 to Hercules Monorail Launcher Assemblies No. 3 and No. 4

Note. The key numbers shown in parentheses in this paragraph refer to figure 289.20 unless otherwise indicated.

Cable assemblies (4, 5, and 6) extend from launcher control-indicator No. 3 (16) through conduit (3) to the power distribution box assembly and the launcher base assembly of Hercules monorail launcher assembly No. 3 (9). An additional set of cable assemblies (4, 5 and 6) extend from launcher control-indicator No. 4 (44) to the power distribution box assembly and launcher base assembly of Hercules monorail launcher assembly No. 4 (2). Typical removal and installation procedures for these cable assemblies are described in *a* and *b* below.

Warning: Before disconnecting or connecting any external power cables, deenergize the launching section rotary converter. Voltages DANGEROUS TO LIFE are present when the launching section rotary converter is in operation.

a. Removal.

- (1) Deenergize launching section rotary converter.
- (2) Disconnect cable assembly (4, 5, or 6) or assemblies from receptacle connector (C, D, or E, fig. 270) on launcher control-indicator.
- (3) Remove trench cover plates (47) from the cable trench (17) leading from the launcher control-indicator to the

handhole (10) in the missile storage room (45).

- (4) Attach a 100-foot pullthrough line or lines to disconnected cable assembly or assemblies as shown in figure 84.
- (5) Tie opposite end of line or lines to trench cover plate (47) in missile storage room (45) to prevent accidental pullthrough.
- (6) Disconnect cable assembly (4, 5, or 6) or assemblies from receptacle connector (C or D, fig. 271) on power distribution box assembly or receptacle connector (F, fig. 271) on launcher base assembly.
- (7) Remove handhole cover (49) on handhole (50) adjacent to the Hercules monorail launcher assembly.
- (8) Pull cable assembly (4, 5, or 6) or assemblies through cable conduit (3) and handhole (50).
- (9) Tie pullthrough line or lines to frame of launcher assembly to prevent accidental pullthrough.

b. Installation.

- (1) Connect cable assembly (4, 5, or 6) or assemblies to J69C or J69B receptacle connector (C or D, fig. 271) on power distribution box assembly or J81A receptacle connector (F, fig. 271) on launcher base assembly.
- (2) Untie secured pullthrough line or lines and attach to opposite end of cable assembly (4, 5, or 6) or assemblies as shown in figure 84.
- (3) Pull cable assembly (4, 5, or 6) or assemblies into handhole (50), through conduit (3), and out of handhole (10).

- 1—1/4-inch wingnut
- 2—1/4-inch lockwasher
- 3—Cable clamp
- 4—Cable saddle support
 - a—1/4-28 x 3 5/16 hexagon-head bolt (2)
 - b—1/4-28 self-locking hexagon nut (2)
 - c—9/32-inch flat washer (2)
 - d—Positioning clamp
 - e—Positioning clamp
- 5—Control cable carrier

- 6—1/2-18 x 1 socket-head capcrew (6)
- 7—Cover plate 92040-2F
- 8—3/8-16 x 3 1/4 hexagon-head capcrew (4)
- 9—3/8-inch lockwasher (4)
- 10—Cable support (4)
- 11—Pin (part of woven cable grip) (2)
- 12—Woven cable grip (2)
- 13—Carriage fin
- 14—Missile launcher carriage

Figure 289.21. HERCULES USARAL cable assemblies—removal and installation—typical for HERCULES monorail launcher assemblies No. 1 and No. 2—legend.

TO LIFE are present when the launching section rotary converter is in operation.

a. Removal.

- (1) Place launcher assembly No. 1 or No. 2 (15 or 33) in the firing position (out and locked).
- (2) Deenergize launching section rotary converter.
- (3) Disconnect cable assembly (11, 12, or 13) or assemblies from receptacle connector (C, D, or E, fig. 270) on launcher control-indicator.
- (4) Remove trench cover plates (47) from the cable trench (17), as required.
- (5) Remove cable assembly (11, 12, or 13) or assemblies from trench (17), through cable access (18).
- (6) Remove cable assembly (11, 12, or 13) or assemblies from cable trough (35) leading to control cable carrier (19).
- (7) Remove cable clamps (8, view B, fig. 289.21) and cable saddle support (4, fig. 289.21) from cable assemblies (11, 12, and 13).
- (8) Remove cable assembly (11, 12, or 13) or assemblies from control cable carriers (5, fig. 289.21).
- (9) Remove cover plate (7, fig. 289.21) from carriage fin (13, fig. 289.21) on missile launcher carriage (14, fig. 289.21).
- (10) Remove woven cable grips (12, fig. 289.21), as required, from cable assembly (11, 12, or 13) or assemblies.
- (11) Disconnect cable (11, 12, or 13) or assemblies from receptacle connector (C or D, fig. 271) on power distribution box assembly, or receptacle connector (F, fig. 271) on launcher base assembly.
- (12) Feed cable assembly (11, 12, or 13) or assemblies through carriage fin (13, fig. 289.21) in to tunnel.

b. Installation.

- (1) Connect cable assembly (11, 12, or 13) or assemblies to J69C or J69B

receptacle connector (C or D, fig. 271) on power distribution box assembly, or J81A receptacle connector (F, fig. 271) on launcher base assembly.

- (2) Feed opposite end of cable assembly (11, 12, or 13) or assemblies through carriage fin (13, fig. 289.21) on missile launcher carriage (14, fig. 289.21).
 - (3) Wrap exposed portion of cable assembly (11, 12, or 13) or assemblies between receptacle connectors J69C, J69B, and J81A (C, D, and F, fig. 271) and carriage fin (13, fig. 289.21) with asbestos insulation tape and wire as described in paragraph 38c.
 - (4) Install cable assembly (11, 12, or 13) or assemblies in woven cable grips (12, fig. 289.21), as required.
- Note.* Cable assembly (11, 12, or 13) or assemblies must be installed in the woven cable grips (12, fig. 289.21) to relieve any strain between receptacle connectors (C, D, and F, fig. 271) and the cable grip (12, fig. 289.21).
- (5) Install cover plate (7, fig. 289.21) on carriage fin (13, fig. 289.21).
 - (6) Position cable assembly (11, 12, or 13), or assemblies on control cable carriers (5, fig. 289.21) as required.
 - (7) Install cable clamps (8, fig. 289.21) and cable saddle support (4, fig. 289.21) on cable assemblies (11, 12, and 13).
 - (8) Position cable assembly (11, 12, or 13) or assemblies in cable trough (35) leading from control cable carrier (19) to cable access (18) adjacent to launcher control-indicator.
 - (9) Feed cable assembly (11, 12, or 13) or assemblies through cable access (18) into cable trench (17).
 - (10) Connect cable assembly (11, 12, or 13) or assemblies to J81B, J69A, or J69D receptacle connector (C, D, or E, fig. 270) on launcher control-indicator.
 - (11) Install trench cover plates (47) on cable trench (17) as required.

194.94. Cable Assemblies—Launcher Control-Indicators No. 1 and No. 4 to Hercules Monorail Launcher Assemblies No. 3 and No. 4

Note. The key numbers shown in parentheses in this paragraph refer to figure 289.20 unless otherwise indicated.

Cable assemblies (4, 5, and 6) extend from launcher control-indicator No. 3 (16) through conduit (3) to the power distribution box assembly and the launcher base assembly of Hercules monorail launcher assembly No. 3 (9). An additional set of cable assemblies (4, 5 and 6) extend from launcher control-indicator No. 4 (44) to the power distribution box assembly and launcher base assembly of Hercules monorail launcher assembly No. 4 (2). Typical removal and installation procedures for these cable assemblies are described in *a* and *b* below.

Warning: Before disconnecting or connecting any external power cables, deenergize the launching section rotary converter. Voltages DANGEROUS TO LIFE are present when the launching section rotary converter is in operation.

a. Removal.

- (1) Deenergize launching section rotary converter.
- (2) Disconnect cable assembly (4, 5, or 6) or assemblies from receptacle connector (C, D, or E, fig. 270) on launcher control-indicator.
- (3) Remove trench cover plates (47) from the cable trench (17) leading from the launcher control-indicator to the

handhole (10) in the missile storage room (45).

- (4) Attach a 100-foot pullthrough line or lines to disconnected cable assembly or assemblies as shown in figure 84.
- (5) Tie opposite end of line or lines to trench cover plate (47) in missile storage room (45) to prevent accidental pullthrough.
- (6) Disconnect cable assembly (4, 5, or 6) or assemblies from receptacle connector (C or D, fig. 271) on power distribution box assembly or receptacle connector (F, fig. 271) on launcher base assembly.
- (7) Remove handhole cover (49) on handhole (50) adjacent to the Hercules monorail launcher assembly.
- (8) Pull cable assembly (4, 5, or 6) or assemblies through cable conduit (3) and handhole (50).
- (9) Tie pullthrough line or lines to frame of launcher assembly to prevent accidental pullthrough.

b. Installation.

- (1) Connect cable assembly (4, 5, or 6) or assemblies to J69C or J69B receptacle connector (C or D, fig. 271) on power distribution box assembly or J81A receptacle connector (F, fig. 271) on launcher base assembly.
- (2) Untie secured pullthrough line or lines and attach to opposite end of cable assembly (4, 5, or 6) or assemblies as shown in figure 84.
- (3) Pull cable assembly (4, 5, or 6) or assemblies into handhole (50), through conduit (3), and out of handhole (10).

- 1—1/4-inch wingnut
- 2—1/4-inch lockwasher
- 3—Cable clamp
- 4—Cable saddle support
 - a—1/4-28 x 3 5/16 hexagon-head bolt (2)
 - b—1/4-28 self-locking hexagon nut (2)
 - c—9/32-inch flat washer (4)
- d—Positioning clamp
- e—Positioning clamp
- 5—Control cable carrier

- 6—1/2-13 x 1 socket-head capcrew (6)
- 7—Cover plate 92040-2F
- 8—3/8-16 x 3 1/4 hexagon-head capcrew (4)
- 9—3/8-inch lockwasher (4)
- 10—Cable support (4)
- 11—Pin (part of woven cable grip) (2)
- 12—Woven cable grip (2)
- 13—Carriage fin
- 14—Missile launcher carriage

Figure 289.21. HERCULES USARAL cable assemblies—removal and installation—typical for HERCULES monorail launcher assemblies No. 1 and No. 2—legend.

- (4) Position cable assembly (4, 5, or 6) or assemblies in cable trench (17) leading from handhole (10) in the missile storage room (45) to the launcher control-indicator.
- (5) Connect cable assembly (4, 5, or 6) or assemblies to J81B, J69A, or J69D receptacle connector (C, D, or E, fig. 270) on launcher control-indicator.
- (6) Install handhole cover (49) on handhole (50) adjacent to the launcher assembly.
- (7) Wrap exposed portion of cable assembly (4, 5, or 6) or assemblies between handhole (50) and the J69C, J69B and J81A receptacle connectors (C, D, and F, fig. 271) with asbestos insulation tape and wire as described in paragraph 38c.
- (8) Install trench cover plates (47) on the cable trench (17) leading from handhole (10) in the missile storage room (45) to the launcher control-indicator.

194.95. Cable Assemblies—Hercules Monorail Launcher Assembly No. 1 or No. 2 to Hercules Section Simulator Group

Notes. The key numbers shown in parentheses in this paragraph refer to figure 289.20 unless otherwise indicated.

Cable assembly (14) extends from the power distribution box assembly on Hercules monorail launcher assembly No. 1 (15) through tunnel (20), through cable duct (39) to the Hercules section simulator group (41). Cable assembly (36) extends from the power distribution box assembly on Hercules monorail launcher assembly No. 2 (33), through tunnel (37), through cable duct (39), to the Hercules section simulator group (41). Typical removal and installation procedures for these cable assemblies are described in *a* and *b* below.

Warning: Before disconnecting or connecting any external power cables, deenergize the launching section rotary converter. Voltages DANGEROUS TO LIFE are present when the launching section rotary converter is in operation.

a. Removal.

- (1) Place launcher assembly No. 1 (15) or No. 2 (33) in the firing position (out and locked).
- (2) Deenergize launching section rotary converter.
- (3) Disconnect cable assembly (14 or 36) from receptacle connector (P or Q, fig. 279) on Hercules section simulator group (41).
- (4) Attach a 25-foot pullthrough line to the disconnected cable assembly as shown in figure 84.
- (5) Tie opposite end of pullthrough line to handle of simulator group (41) to prevent accidental pullthrough.
- (6) Pull cable assembly (14 or 36) out of section control room (43), through duct (39), into basement (24).
- (7) Untie pullthrough line from cable assembly (14 or 36) and attach line to cable trough (35) to prevent accidental pullthrough.
- (8) Remove cable assembly (14 or 36) from cable trough (35) leading to cable carrier (19).
- (9) Remove cable clamps (3, fig. 289.21) and cable saddle support (4, fig. 289.21) from cable assemblies (14 and 36).
- (10) Remove cable assembly (14 or 36) from cable carriers (5, fig. 289.21).
- (11) Remove cover plate (7, fig. 289.21) from carriage fin (13, fig. 289.21) on missile launcher carriage (14, fig. 289.21).
- (12) Remove woven cable grip (12, fig. 289.21), as required, from cable assembly (14 or 36).
- (13) Disconnect cable assembly (14 or 36) from receptacle connector (B, fig. 271) on power distribution box assembly of launcher base assembly.
- (14) Feed cable assembly (14 or 36) through carriage fin (13, fig. 289.21) in to tunnel (20).

b. Installation.

- (1) Connect cable assembly (14 or 36) to J6A receptacle connector (B, fig. 271)

on power distribution box assembly of launcher base assembly.

- (2) Feed opposite end of cable assembly (14 or 36) through carriage fin (13, fig. 289.21) on missile launcher carriage (14, fig. 289.21).
 - (3) Wrap exposed portion of cable assembly (14 or 36) between J6A receptacle connector (B, fig. 271) and carriage fin (13, fig. 289.21) with asbestos insulation tape and wire as described in paragraph 38c.
 - (4) Install cable assembly (14 or 36) in woven cable grip (12, fig. 289.21), as required.
- Note.* The cable assembly must be installed in the cable grip to relieve any strain between the receptacle connector and the cable grip.
- (5) Position cable assembly (14 or 36) on control cable carriers (5, fig. 289.21), as required.
 - (6) Install cable clamps (3, fig. 289.21) and support the cable saddle support (4, fig. 289.21) on cable assemblies (14 and 36).
 - (7) Install cover plate (7, fig. 289.21) on carriage fin (13, fig. 289.21).
 - (8) Position cable assembly (14 or 36) in cable trough (35) leading from cable carrier (19) to cable duct (39).
 - (9) Untie secured pulldown line and attach to cable assembly (14 or 36) as shown in figure 84.
 - (10) Pull cable assembly (14 or 36) through duct (39) in to section control room (43).
 - (11) Connect cable assembly (14 or 36) to J1K or J1L receptacle connector (P, or Q, fig. 279) on Hercules section simulator group (41).

194.96. Cable Assemblies—Test Stations

Note. The key numbers shown in parentheses in this paragraph refer to figure 289.22 unless otherwise indicated.

Launcher control-indicator No. 1 and No. 2 (9 and 8), each have an identical set of three cable assemblies (2, 3 and 4). Cable assemblies (2, 4, and 5) are utilized with launcher control-indicator No. 3 (10). Cable assemblies (1, 2, and 3) are utilized with launcher control-indicator No. 4 (7). Each of these cable assemblies provides power to one of the 12 test stations located on the side trusses (6). Each cable assembly consists of two cables and a test station.

Warning: Before disconnecting or connecting any external power cables, deenergize the launching section rotary converter. Voltages DANGEROUS TO LIFE are present when the launching section rotary converter is in operation.

a. Removal.

- (1) Deenergize launching section rotary converter.
- (2) Disconnect cable assembly (1, 2, 3, 4, or 5) or assemblies, as required, from receptacle connectors (K through Q, fig. 270) on launcher control-indicator No. 1, No. 2, No. 3, or No. 4 (9, 8, 10, or 7).
- (3) Remove cable assembly (1, 2, 3, 4, or 5) or assemblies from side truss (6) and loading rack clamp assembly (1, view B, fig. 289.19).

b. Installation.

- (1) Position and install cable assembly (1, 2, 3, 4, or 5) or assemblies on side truss (6) and on loading rack clamp assembly (1, view B, fig. 289.19).
- (2) Connect cable assembly (1, 2, 3, 4, or 5) or assemblies, as required, to

- 1—Cable assembly—9032855
- A— $\frac{1}{8}$ -16 hexagon nut
- B— $\frac{1}{8}$ -inch lockwasher
- C—Loading rack clamp
- D— $\frac{1}{8}$ -18 hexagon nut
- E— $\frac{1}{8}$ -inch lockwasher
- F—Launcher hook stud
- 2—Cable assembly—8525075

- 3—Cable assembly—8525076
- 4—Cable assembly—8167662
- 5—Cable assembly—9032532
- 6—Side truss
- 7—Launcher control-indicator No. 4
- 8—Launcher control-indicator No. 2
- 9—Launcher control-indicator No. 1
- 10—Launcher control-indicator No. 3

Figure 289.22. Hercules USARAL test station cable assemblies—removal and installation—legend.

J83C, J70C, J83B, J70B, J83A, or J70A receptacle connector (K, through Q, fig. 270) on launcher control-indicator No. 1, 2, 3 or 4 (9, 8, 10, or 7).

194.97. Cable Assemblies—Launcher Control-Indicators No. 1, No. 2, No. 3, and No. 4 to Interlock Junction Boxes

Note. The key numbers shown in parentheses in this paragraph refer to figure 289.20 unless otherwise indicated.

One cable assembly (22) extends from launcher control-indicator No. 1 (27), through the cable access (18), to the interlock junction box (23) to the rear of tunnel (20). Another cable assembly (22) extends from launcher control-indicator No. 2 (34), through the cable access (18), to the interlock junction box (23) to the rear of tunnel (37). One cable assembly (21) extends from launcher control-indicator No. 3 (16), through the cable access (18) to the interlock junction box (23) to the rear of tunnel (20). Another cable assembly (21) extends from launcher control-indicator No. 4 (44), through the cable access (18) to the interlock junction box (23) to the rear of tunnel (37). Typical removal and installation procedures for these cable assemblies are described in *a* and *b* below.

Warning: Before disconnecting or connecting any power cables, deenergize the section generator or the launching section rotary converter. Voltages DANGEROUS TO LIFE are present when the section generator or the section rotary converter is in operation.

a. Removal.

- (1) Deenergize the section generator or the launching section rotary converter.
- (2) Disconnect the cable assembly (22) from the receptacle connector (S, fig. 270) on the launcher control-indicator.
- (3) Remove the trench cover plates (47) from the cable trench (17) between the launcher control-indicator and the cable access (18).
- (4) Pull the cable assembly through the cable access into the basement (24).
- (5) Remove the cable assembly from the cable trough (35) leading to the inter-

- lock junction box (23) to the rear of the tunnel (20) or the tunnel (37).
- (6) Disconnect the cable assembly from the interlock junction box.

Note. To facilitate installation, identify and list the individual cable conductors by their assigned numbers and color codes as well as their associated terminals in the junction box.

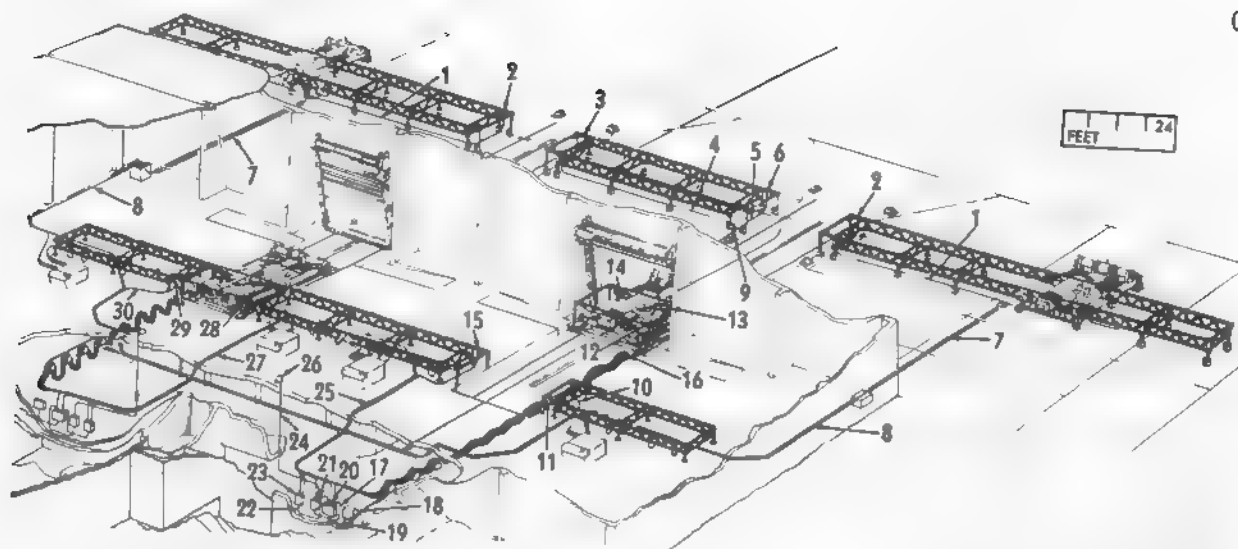
b. Installation.

- (1) Connect the cable assembly (22) to the interlock junction box (23). Install the cable conductors. (Refer to the note in *a*(6) above).
- (2) Position the cable assembly in the cable trough (35) leading from the interlock junction box to the cable access (18) adjacent to the launcher control-indicator.
- (3) Feed the cable assembly through the cable access and into the cable trench (17).
- (4) Position the cable assembly in the cable trench.
- (5) Connect the cable assembly to J45A receptacle connector (S, fig. 270) on the launcher control-indicator.
- (6) Install the trench cover plates (47) on the cable trench between the launcher control-indicator and the cable access.

194.97.1. Cables and Cable Assemblies—Warning Horn

Note. The key numbers shown in parentheses in this paragraph refer to figure 289.22.1 unless otherwise indicated.

Cable assemblies (1) extend from the rail section assemblies (2) to the conduit outlets (23). Cable assemblies (4 and 5) extend from the rail section assemblies (3 and 6) to the conduit outlets (23). Cable assembly (10) extends from the rail section assembly (11) to the conduit outlet (20). On launchers No. 1 and No. 2, cable assemblies (14) extend from the left and right rail section assemblies (12) to the conduit outlets (13). Cables (16) extend from the conduit outlets (13) to the conduit outlets (20). Cables (17) extend from the conduit outlets (20) to the conduit outlets (21). Cables (19) extend from the interlock junction boxes (18) to the conduit outlets (20). Cables



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- 1—Cable assembly 9032978
- 2—Rail section assembly
- 3—Rail section assembly
- 4—Cable assembly 9032980
- 5—Cable assembly 9032979
- 6—Rail section assembly
- 7—Conduit
- 8—Trench
- 9—Conduit
- 10—Cable assembly 9032976
- 11—Rail section assembly
- 12—Rail section assembly (4)
- 13—Conduit outlet (2)
- 14—Cable assembly 8525354 (4)
- 15—Rail section assembly

- 16—Cable 9032276-3 (2)
- 17—Cable 9032276-11 (2)
- 18—Interlock junction box (2)
- 19—Cable 9032276-7 (2)
- 20—Conduit outlet (2)
- 21—Conduit outlet (2)
- 22—Cable 9032276-5 (2)
- 23—Conduit outlet (2)
- 24—Cable 9032276-9 (2)
- 25—Cable assembly 9032977
- 26—Warning horn (2)
- 27—Cable assembly 9032977
- 28—Rail section assembly
- 29—Rail section assembly
- 30—Cable assembly 9032976

Figure 289.22.1. Warning horn cables and cable assemblies—location.

(22) extend from the conduit outlets (20) to the conduit outlets (23). Cables (24) extend from the warning horns (26) to the conduit outlets (21). Cable assembly (25) extends from the rail section assembly (15) to the conduit outlet (21). Cable assembly (27) extends from the rail section assembly (28) to the conduit outlet (20). Cable assembly (30) extends from the rail section assembly (29) to the conduit outlet (21).

Warning: Before disconnecting or connecting any external power cables, deenergize the launching section generator or the launching section rotary converter. Voltages DANGEROUS TO LIFE are present when the section generator or rotary converter is operating.

a. Removal.

(1) Cable assembly (1).

(a) Deenergize the section generator or the rotary converter.

(b) Remove the switch (6, view A, fig.

289.22.2) from the rail section assembly (2).

(c) Remove the other end of the cable assembly from the conduit outlet (13, view C, fig. 289.22.2).

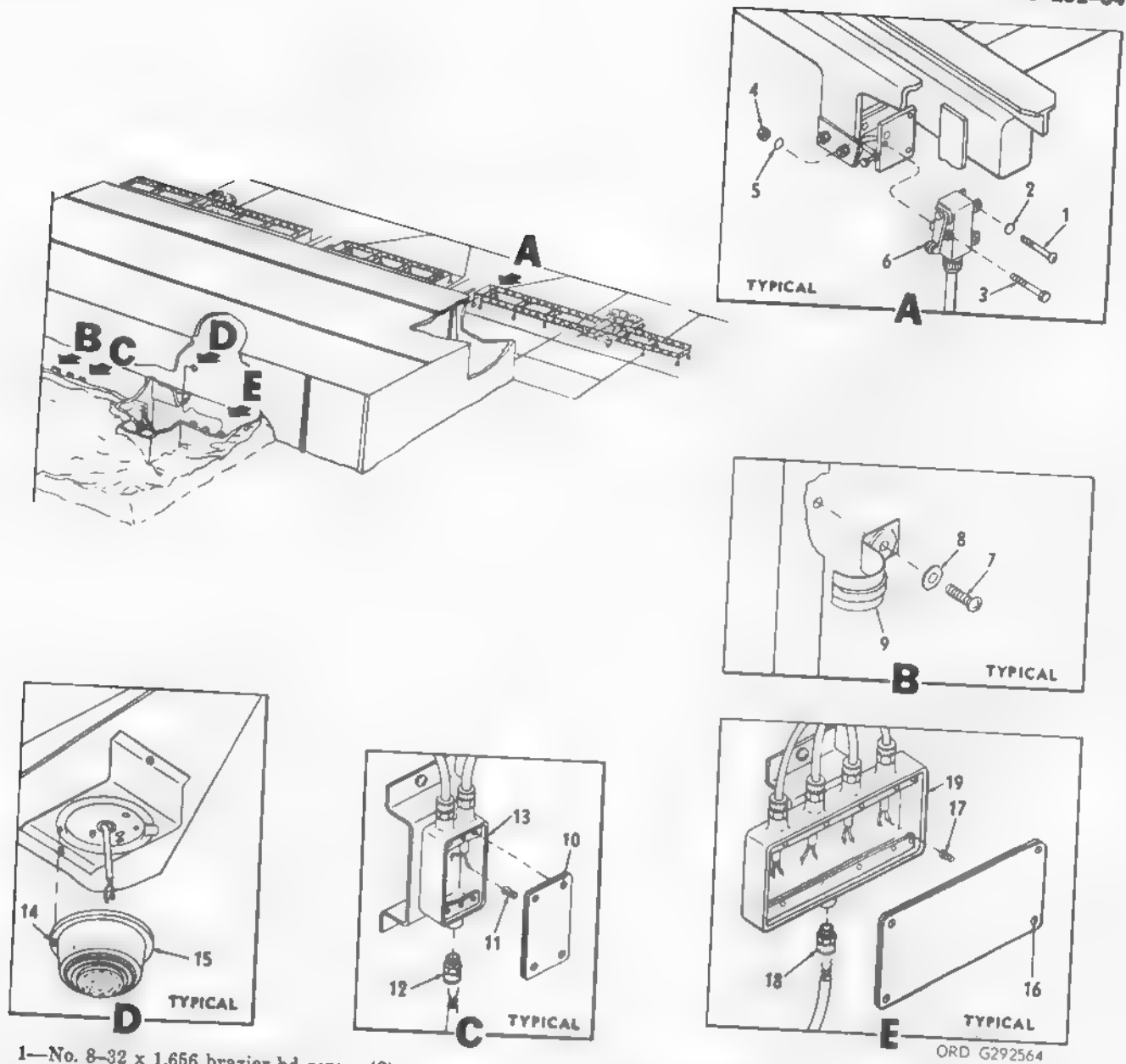
(d) Attach a 100-foot pullthrough line to the disconnected end of the cable assembly (fig. 84).

(e) Tie the opposite end of the line to any convenient object to prevent accidental pullthrough.

(f) Remove the tape securing the cable assembly to the rail section assembly and the loading rack sections.

(g) Remove the retaining strap (9, view B, fig. 289.22.2) that secures the cable assembly.

(h) Remove the cable assembly from the trench (8) and conduit (7) and untie the pullthrough line leaving it in the trench and the conduit.



- 1—No. 8-32 x 1.656 brazier-hd screw (2)
- 2—No. 8 fl washer (2)
- 3—No. 8-32 x 1.906 brazier-hd screw
- 4—No. 8-32 self-lkg hex. nut
- 5—No. 8 fl washer
- 6—Switch
- 7—No. 10-24 x 5/8 rd-hd screw
- 8—No. 10 fl washer AN960-10
- 9—Retaining strap
- 10—Captive screw (4)

- 11—Conductor splice (3)
- 12—Connector
- 13—Conduit outlet
- 14—Captive screw (2)
- 15—Warning horn
- 16—Captive screw (4)
- 17—Conductor splice (6)
- 18—Connector (5)
- 19—Conduit outlet

Figure 239.22.2. Warning-horn cables and cable assemblies—removal and installation.

- (2) *Cable assembly (4 or 5).*
 - (a) Deenergize the section generator or the rotary converter.
 - (b) Remove the switch (6, view A, fig. 289.22.2) from the rail section assembly (3 or 6).
 - (c) Remove the other end of the cable from the conduit outlet (13, view C, fig. 289.22.2).
 - (d) Attach a 100-foot pullthrough line to the disconnected end of the cable assembly (fig. 84).
 - (e) Tie the opposite end of the line to any convenient object to prevent accidental pullthrough.
 - (f) Remove the tape securing the cable assembly to the rail section assembly and loading rack sections.
 - (g) Remove the retaining strap (9, view B, fig. 289.22.2) that secures the cable assembly.
 - (h) Remove the cable assembly from the conduit (9) and the cable trough (35, fig. 289.20) and untie the pullthrough line, leaving it in the conduit and the trough.
- (3) *Cable assembly (10).*
 - (a) Deenergize the section generator or the rotary converter.
 - (b) Remove the switch (6, view A, fig. 289.22.2) from the rail section assembly (11).
 - (c) Remove the other end of the cable assembly from the conduit outlet (19, view E, fig. 289.22.2).
 - (d) Attach a 25-foot pullthrough line to the disconnected end of the cable assembly (fig. 84).
 - (e) Tie the opposite end of the line to any convenient object to prevent accidental pullthrough.
 - (f) Remove the tape securing the cable assembly to the rail section assembly.
 - (g) Remove the retaining straps (9, view B, fig. 289.22.2) that secure the cable assembly.
 - (h) Remove the cable assembly from the trench (8) and the cable trough (35, fig. 289.20), and untie the pullthrough line, leaving it in the trench and the trough.

- (4) *Cable assembly (14).*
 - (a) Deenergize the section generator or the rotary converter.
 - (b) Remove the switch (6, view A, fig. 289.22.2) from the rail section assembly (12).
 - (c) Remove the other end of the cable assembly from the conduit outlet (13, view C, fig. 289.22.2).
 - (d) Remove the tape securing the cable assembly to the rail section assembly.
 - (e) Remove the cable assembly.
- (5) *Cable (16).*
 - (a) Place launcher No. 1 or No. 2 (15 or 33, fig. 289.20) in the firing position (out and locked).
 - (b) Deenergize the section generator or the rotary converter.
 - (c) Remove one end of the cable from the conduit outlet (13, view C, fig. 289.22.2).
 - (d) Remove the other end of the cable from the conduit outlet (19, view E, fig. 289.22.2).
 - (e) Remove the retaining straps (9, view B, fig. 289.22.2) that secure the cable.
 - (f) Attach a 25-foot pullthrough line to the disconnected end of the cable assembly (fig. 84).
 - (g) Tie the opposite end of the line to any convenient object to prevent accidental pullthrough.
 - (h) Pull the cable out of the cable trough (35, fig. 289.20) into the tunnel (20, fig. 289.20).
 - (i) Untie the pullthrough line and attach to the cable trough to prevent accidental pullthrough.
 - (j) Remove the cable clamps (3, fig. 289.21) and the cable saddle supports (4, fig. 289.21) from the cable and the cable assemblies.
 - (k) Remove the cable from the cable carriers (5, fig. 289.21).
 - (l) Remove the cover plate (7, fig. 289.21) from the carriage fin (13, fig. 289.21) on the missile launcher carriage (14, fig. 289.21).
 - (m) Remove the woven cable grip (12, fig. 289.21) holding the cable.

- (n) Remove the cable.
- (6) *Cable (17).*
 - (a) Deenergize the section generator or the rotary converter.
 - (b) Remove one end of the cable from the conduit outlet (19, view E, fig. 289.22.2).
 - (c) Remove the other end of the cable from the conduit outlet (13, view C, fig. 289.22.2).
 - (d) Remove the retaining strap (9, view B, fig. 289.22.2).
 - (e) Remove the cable.
- (7) *Cable (19).*
 - (a) Deenergize the section generator or the rotary converter.
 - (b) Remove one end of the cable from the interlock junction box (18).
 - (c) Remove the other end of the cable from the conduit outlet (19, view E, fig. 289.22.2).
 - (d) Remove the retaining strap (9, view B, fig. 289.22.2).
 - (e) Remove the cable.
- (8) *Cable (22).*
 - (a) Deenergize the section generator or the rotary converter.
 - (b) Remove one end of the cable from the conduit outlet (19, view E, fig. 289.22.2).
 - (c) Remove the other end of the cable from the conduit outlet (13, view C, fig. 289.22.2).
 - (d) Remove the retaining strap (9, view B, fig. 289.22.2).
 - (e) Remove the cable.
- (9) *Cable (24).*
 - (a) Deenergize the section generator or the rotary converter.
 - (b) Remove one end of the cable from the conduit outlet (13, view C, fig. 289.22.2).
 - (c) Remove the other end of the cable from the warning horn (15, view D, fig. 289.22.2).
 - (d) Remove the retaining straps (9, view B, fig. 289.22.2).
 - (e) Remove the cable.
- (10) *Cable assembly (25).*
 - (a) Deenergize the section generator or the rotary converter.
- (b) Remove one end of the cable assembly from the conduit outlet (13, view C, fig. 289.22.2).
- (c) Remove the retaining strap (9, view B, fig. 289.22.2).
- (d) Attach a 25-foot pullthrough line to the disconnected end of the cable assembly (fig. 84).
- (e) Tie the opposite end of the pullthrough line to any convenient object to prevent accidental pullthrough.
- (f) Pull the cable through the trench (8) to the rail section assembly (15) and untie the pullthrough line, leaving the line in the trench.
- (g) Remove the switch (6, view A, fig. 289.22.2) from the rail section assembly.
- (h) Remove the tape securing the cable assembly to the rail section assembly.
- (11) *Cable assembly (27).*
 - (a) Deenergize the section generator or the rotary converter.
 - (b) Remove one end of the cable assembly from the conduit outlet (19, view E, fig. 289.22.2).
 - (c) Remove the retaining straps (9, view B, fig. 289.22.2).
 - (d) Attach a 25-foot pullthrough line to the disconnected end of the cable assembly (fig. 84).
 - (e) Tie the opposite end of the pullthrough line to any convenient object to prevent accidental pullthrough.
 - (f) Pull the cable through the trench (8) to the rail section assembly (28) and untie the pullthrough line, leaving the line in the trench.
 - (g) Remove the switch (6, view A, fig. 289.22.2) from the rail section assembly.
 - (h) Remove the tape securing the cable assembly to the rail section assembly.
 - (i) Remove the cable assembly.
- (12) *Cable assembly (30).*
 - (a) Deenergize the section generator or the rotary converter.

- (b) Remove one end of the cable assembly from the conduit outlet (13, view C, fig. 289.22.2).
- (c) Remove the retaining strap (9, view B, fig. 289.22.2).
- (d) Attach a 25-foot pullthrough line to the disconnected end of the cable assembly (fig. 84).
- (e) Tie the opposite end of the pullthrough line to any convenient object to prevent accidental pullthrough.
- (f) Pull the cable through the trench (8) to the rail section assembly (29) and untie the pullthrough line, leaving the line in the trench.
- (g) Remove the switch (6, view A, fig. 289.22.2) from the rail section assembly.
- (h) Remove the tape securing the cable assembly to the rail section assembly.

b. Installation.

(1) Cable assembly (1).

- (a) Install the switch (6, view A, fig. 289.22.2) on the rail section assembly (2).
- (b) Untie the secured pullthrough line and attach it to the free end of the cable assembly (fig. 84).
- (c) Pull the cable assembly through the conduit (7) and the trench (8).
- (d) Untie the pullthrough line.

Note. For connection of the cable assembly wires within the conduit outlet, refer to TM 9-1440-250-35.

- (e) Install the end of the cable assembly in the conduit outlet (13, view C, fig. 289.22.2).
 - (f) Secure the cable assembly to the wall with the retaining strap (9, view B, fig. 289.22.2).
 - (g) Secure the cable assembly to the rail section assembly and the loading rack sections with tape.
 - (h) Wrap the exposed portion of the cable assembly with insulation tape as described in paragraph 38c.
- (2) Cable assembly (4 or 5).**

- (a) Install the switch (6, view A, fig. 289.22.2) on the rail section assembly (3 or 6).

- (b) Untie the secured pullthrough line and attach to the free end of the cable assembly (fig. 84).
- (c) Pull the cable assembly through the conduit (9) and the cable through (35, fig. 289.20).
- (d) Untie the pullthrough line.

Note. For connection of the cable assembly wires within the conduit outlet, refer to TM 9-1440-250-35.

- (e) Install the end of the cable assembly in the conduit outlet (13, view C, fig. 289.22.2).
- (f) Secure the cable assembly to the wall with the retaining strap (9, view B, fig. 289.22.2).
- (g) Secure the cable assembly to the rail section assembly and the loading rack sections with tape.
- (h) Wrap the exposed portion of the cable assembly with insulation tape as described in paragraph 38c.

(3) Cable assembly (10).

- (a) Install the switch (6, view A, fig. 289.22.2) on the rail section assembly (11).
- (b) Untie the secured pullthrough line and attach to the free end of the cable assembly (fig. 84).
- (c) Pull the cable assembly through the trench (8).
- (d) Untie the pullthrough line.

Note. For connection of the cable assembly wires within the conduit outlet, refer to TM 9-1440-250-35.

- (e) Install the end of the cable assembly in the conduit outlet (19, view E, fig. 289.22.2).
 - (f) Secure the cable assembly to the wall with the retaining straps (9, view B, fig. 289.22.2).
 - (g) Secure the cable assembly to the rail section assembly with tape.
- (4) Cable assembly (14).**

- (a) Install the switch (6, view A, fig. 289.22.2) on the rail section assembly (12).

Note. For connection of the cable assembly wires within the conduit outlet, refer to TM 9-1440-250-35.

- (b) Install the other end of the cable

assembly in the conduit outlet (13, view C, fig. 289.22.2).

(c) Secure the cable assembly to the rail section assembly with tape.

(d) Wrap the exposed portion of the cable assembly with insulation tape as described in paragraph 38c.

(5) *Cable (16).*

Note. For connection of the cable wires within the conduit outlets, refer to TM 9-1440-250-35.

(a) Install one end of the cable in the conduit outlet (19, view E, fig. 289.22.2).

(b) Secure the cable in retaining straps (9, view B, fig. 289.22.2).

(c) Untie the secured pullthrough line and attach to the cable (fig. 84).

(d) Pull the cable through the cable trough (35, fig. 289.20) to the tunnel (20, fig. 289.20). Untie the pull-through line.

(e) Position the cable and cable assemblies in the control cable carriers (5, fig. 289.21).

(f) Install the cable clamps (3, fig. 289.21) and the cable saddle supports (4, fig. 289.21).

Note. The cable must be installed in the cable grip to relieve any strain between the conduit outlet (13) and the cable grip.

(g) Feed the cable through the woven cable grip (12, fig. 289.21) and the carriage fin (13, fig. 289.21).

(h) Install the cover plate (7, fig. 289.21).

(i) Install the end of the cable in the conduit outlet (13).

(j) Wrap the exposed portion of the cable between the conduit outlet and the carriage fin with insulation tape as described in paragraph 38c.

(6) *Cable (17).*

Note. For connection of the cable wires within the conduit outlets, refer to TM 9-1440-250-35.

(a) Install one end of the cable in the conduit outlet (19, view E, fig. 289.22.2).

(b) Install the other end of the cable in the conduit outlet (13, view C, fig. 289.22.2).

(c) Secure the cable to the wall with the retaining strap (9, view B, fig. 289.22.2).

(7) *Cable (19).*

Note. For connection of the cable wires within the interlock junction box and the conduit outlet, refer to TM 9-1440-250-35.

(a) Install one end of the cable in the interlock junction box (18).

(b) Install the other end of the cable in the conduit outlet (19, view E, fig. 289.22.2).

(c) Secure the cable to the wall with the retaining straps (9, view B, fig. 289.22.2).

(8) *Cable (22).*

Note. For connection of the cable wires within the conduit outlets, refer to TM 9-1440-250-35.

(a) Install one end of the cable in the conduit outlet (19, view E, fig. 289.22.2).

(b) Install the other end of the cable in the conduit outlet (13, view C, fig. 289.22.2).

(c) Secure the cable to the wall with the retaining strap (9, view B, fig. 289.22.2).

(9) *Cable (24).*

Note. For connection of the cable wires within the warning horn and the conduit outlet, refer to TM 9-1440-250-35.

(a) Install one end of the cable in the warning horn (15, view D, fig. 289.22.2).

(b) Install the other end of the cable in conduit outlet (13, view C, fig. 289.22.2).

(c) Secure the cable to the wall with the retaining straps (9, view B, fig. 289.22.2).

(10) *Cable assembly (25).*

(a) Install the switch (6, view A, fig. 289.22.2) on the rail section assembly (15).

(b) Untie the secured pullthrough line and attach to the free end of the cable assembly (fig. 84).

(c) Pull the cable assembly through the trench (8).

- (d) Untie the pullthrough line.

Note. For connection of the cable assembly wires within the conduit outlet, refer to TM 9-1440-250-35.

- (e) Install the end of the cable assembly in the conduit outlet (13, view C, fig. 289.22.2).
 - (f) Secure the cable assembly to the wall with the retaining strap (9, view B, fig. 289.22.2).
 - (g) Secure the cable assembly to the rail section assembly with tape.
- (11) *Cable assembly (27).*
- (a) Install the switch (6, view A, fig. 289.22.2) on the rail section assembly (28).
 - (b) Untie the secured pullthrough line and attach to the free end of the cable assembly (fig. 84).
 - (c) Pull the cable assembly through the trench (8).
 - (d) Untie the pullthrough line.

Note. For connection of the cable assembly wires within the conduit outlet, refer to TM 9-1440-250-35.

- (e) Install the end of the cable assembly in the conduit outlet (19, view E, fig. 289.22.2).
 - (f) Secure the cable assembly to the wall with the retaining straps (9, view B, fig. 289.22.2).
 - (g) Secure the cable assembly to the rail section assembly with tape.
- (12) *Cable assembly (30).*
- (a) Install the switch (6, view A, fig. 289.22.2), on the rail section assembly (29).
 - (b) Untie the secured pullthrough line and attach to the free end of the cable assembly (fig. 84).
 - (c) Pull the cable assembly through the trench (8).
 - (d) Untie the pullthrough line.

Note. For connection of the cable assembly wires within the conduit outlet, refer to TM 9-1440-250-35.

- (e) Install the end of the cable assembly in the conduit outlet (13, view C, fig. 289.22.2).
- (f) Secure the cable assembly to the wall

with the retaining strap (9, view B, fig. 289.22.2).

- (g) Secure the cable assembly to the rail section assembly with tape.

194.98. Permanent Magnet Loudspeaker Assembly—Wall-Mounted

Note. The key numbers shown in parentheses in this paragraph refer to figure 289.20, unless otherwise indicated.

Two loudspeaker assemblies (26) are mounted on the wall of the missile storage room (45). One loudspeaker is mounted on the wall forward of launcher No. 1 (15) and is connected to launcher control-indicator No. 1 (27). Another loudspeaker is mounted on the wall forward of launcher No. 2 (33) and is connected to launcher control-indicator No. 2 (34). The cable for each loudspeaker assembly extends through a conduit (25) leading to the basement (24) into the cable trough (35), and then through a cable trench (17) leading to the launcher control-indicator. Typical removal and installation procedures for these loudspeaker assemblies are described in *a* and *b* below.

a. Removal.

- (1) Disconnect the cable of the loudspeaker assembly from the receptacle connector (R, fig. 270) on the launcher control-indicator.
- (2) Remove the trench cover plates (47) from the cable trench (17) leading from the launcher control-indicator to the cable access (18).
- (3) Pull the cable through the cable access into the basement (24).
- (4) Remove the cable from the cable trough (35) leading to the conduit (25).
- (5) Pull the cable through the conduit into the missile storage room (45).
- (6) Remove the retaining straps (53) securing the cable to the wall of the missile storage room.
- (7) Remove the loudspeaker assembly (26) from the wall of the missile storage room.

b. Installation.

- (1) Install the permanent magnet loudspeaker assembly (26) on the wall of the missile storage room (45).

- (2) Install the retaining strap (53) securing the cable of the loudspeaker assembly to the wall of the missile storage room.
- (3) Feed the cable through the vertical conduit (25).
- (4) Position the cable in the cable trough (35).
- (5) Feed the cable through the cable access (18) to the cable trench (17) leading to the launcher control-indicator.
- (6) Position the cable in the trench.
- (7) Connect the cable to J12B receptacle connector (R, fig. 270) on the launcher control-indicator.
- (8) Install the trench cover plates (47) on the trench leading from the cable access to the launcher control-indicator.

194.99. Loudspeaker with Cable Assembly—Truss-Mounted

Note. The key numbers shown in parentheses in this paragraph refer to figure 289.20, unless otherwise indicated.

There are two loudspeakers with cable assemblies (7) located on the side trusses (8) adjacent to launchers No. 3 and 4 (9 and 2). The cable assembly of each loudspeaker is connected to the power distribution box assembly of each launcher.

a. Removal.

- (1) Disconnect the cable assembly from the receptacle connector (A, fig. 271) on the power distribution box assembly.

- (2) Remove the loudspeaker with cable assembly (7) from the side truss (8), as required.

b. Installation.

- (1) Position and secure the loudspeaker with cable assembly (7) to the side truss (8).
- (2) Connect the cable assembly to J12A receptacle connector (A, fig. 271) on the power distribution box assembly.
- (3) Wrap the cable assembly with asbestos insulation tape and wire as described in paragraph 38c.

194.100. Cable Assemblies—Test Station Hydraulic Pumping Unit

Note. The key numbers shown in parentheses in this paragraph refer to figure 289.20, unless otherwise indicated.

Cable assemblies (31 and 32) extend from the circuit breaker box (30) through the cable trench (17) into the cable trough (35), through the cable duct (39) to the three-way junction box (42) in the section control room (43). Cable assembly (28) extends from the circuit breaker box (30) to the test station hydraulic pumping unit (29).

Warning: Before disconnecting or connecting any external power cables, deenergize the section generator or the launching section rotary converter. Voltages DANGEROUS TO LIFE are present when the section generator or the section rotary converter is in operation.

*a. Removal.**(1) Cable assemblies (31 and 32).*

- (a) Deenergize launching section rotary converter.
- (b) Disconnect cable assembly (31 or 32) or assemblies from receptacle connector (2 or 3, fig. 289.26) on three-way junction box (42) and cap receptacle connectors.
- (c) Attach a 25-foot pullthrough line to the disconnected cable assembly or assemblies as shown in figure 84.
- (d) Tie opposite end of pullthrough line or lines to handle of Hercules section simulator group (41) to prevent accidental pullthrough.
- (e) Pull cable assembly (31 or 32) or assemblies out of section control room (43), through duct (39), into basement (24).
- (f) Untie pullthrough line from cable assembly (31 or 32) or assemblies and attach line or lines to cable trough (35) to prevent accidental pullthrough.
- (g) Remove cable trench covers (47) from portion of trench leading to test station hydraulic pumping unit (29).
- (h) Disconnect cable assembly (31 or 32) from receptacle connector (1, or 2, fig. 10.2) on circuit breaker box (30).
- (i) Pull opposite end of cable assembly (31 or 32) or assemblies from cable trough (35) through cable access (18) into cable trench (17).
- (j) Remove cable assembly (31 or 32) or assemblies from cable trench (17).

(2) Cable assembly (28).

- (a) Deenergize the section rotary converter.
- (b) Disconnect cable assembly (28) from receptacle connector (5, fig.

10.2) on circuit breaker box (30) and receptacle connector (5, fig. 10.1) on test station hydraulic pumping unit (3, fig. 10.1).

- (c) Remove cable assembly.

*b. Installation.**(1) Cable assemblies (31 and 32).*

- (a) Connect cable assembly (31 or 32) or assemblies to J69A or J79A receptacle connector (1 or 2, fig. 10.2) on circuit breaker box (30).
 - (b) Position cable assembly (31 or 32) or assemblies in cable trench (17) leading from the test station hydraulic pumping unit (29) to cable access (18).
 - (c) Feed cable assembly (31 or 32) or assemblies through cable access (18) into basement (24).
 - (d) Position cable assembly (31 or 32) or assemblies in cable trough (35) between cable access (18) and cable duct (39).
 - (e) Untie secured pullthrough line and attach to cable assembly as shown in figure 84.
 - (f) Pull cable assembly (31 or 32) or assemblies through duct (39) into section control room (43).
 - (g) Connect cable assembly (31 or 32) or assemblies to J78A or J95A receptacle connector (2 or 3, fig. 289.26) on three-way junction box (42).
 - (h) Install cable trench covers (47) on portion of trench (17) between cable access (18) and test station hydraulic pumping unit (29).
- (2) Cable assembly (28).*
- (a) Connect cable assembly (28) to J97A receptacle connector (5, fig. 10.2) on the circuit breaker box (30) and J42A receptacle connector (3, fig. 10.1) on the test station hydraulic pumping unit (29).

Section IV. MAINTENANCE OF HERCULES USARAL LAUNCHING SECTION MODIFICATION KIT MECHANICAL COMPONENTS

194.101. General

This section describes maintenance procedures for the HERCULES USARAL launching section modification kit mechanical components that are not covered in the preceding hydraulic and electrical sections.

194.102. Rail Section Assemblies

Note. The key numbers shown in parentheses in this paragraph refer to figure 289.23 unless otherwise indicated.

Twelve rail section assemblies (1, 2, 3, and 4) are utilized in a HERCULES USARAL launching section. Rail section assembly (3) is attached to the left side of launchers No. 1 and No. 2. Rail section assembly (2) is attached to the right side of launchers No. 1 and No. 2. Rail section assembly (1) is attached to the interior and exterior loading racks to the right of launchers No. 1 and No. 2. Rail section assembly (4) is attached to the interior and exterior loading racks to the left of launchers No. 1 and No. 2. The procedures described in *a* through *d* below are typical for the removal, disassembly, assembly, and installation of these rail section assemblies.

a. Removal.

- (1) Remove and disassemble the switch actuator arm (10).
- (2) Remove and disassemble the switch mounting bracket (18).
- (3) Remove the rail section assembly (fig. 289.24).

b. Disassembly. Disassemble the rail section assembly (fig. 289.25).

c. Assembly. Assemble the rail section assembly (fig. 289.25).

d. Installation.

- (1) Install the rail section assembly (fig. 289.24).
- (2) Assemble and install the switch mounting bracket (18).
- (3) Assemble and install the switch actuator arm (10).
- (a) Trim the track section of the rail

section assembly to clear the adjacent rail section assembly.

Note. Clearance must not exceed $\frac{1}{8}$ inch.

- (b) Adjust the setscrews (12) to position the actuator arm (10) $1\frac{3}{8}$ inch from the tee track of the rail section assembly. Tighten the nuts (11).

194.103. Mounting Brackets—Launchers No. 1, No. 2, No. 3, or No. 4

Six mounting brackets (fig. 287) are used to support the launcher base assembly. Typical removal and installation procedures for one set of six brackets are described in *a* and *b* below.

Warning: Before disconnecting or connecting any external power cables, deenergize the section generator or the section rotary converter. Voltages DANGEROUS TO LIFE are present when the section generator or the rotary converter is in operation.

a. Removal.

- (1) Attach the multiple leg slings (fig. 287) to the intermediate lifting lugs on the launcher assembly, using the attached toggle pins.
- (2) Remove the hexagon nuts, lockwashers and square flat washers (fig. 287) from the anchor bolts at each mounting bracket.
- (3) Deenergize the section generator or the launching section rotary converter.
- (4) Disconnect the cable assemblies from launchers No. 1, No. 2, No. 3, or No. 4 as follows:

- (a) *Launcher No. 1.* Disconnect the cable assemblies from the receptacle connectors (B, C, D, and F, fig. 271) on the power distribution box assembly and the launcher base assembly.
- (b) *Launcher No. 2.* Disconnect the cable assemblies from the receptacle connectors (B, C, D, and F, fig. 271) on the power dis-

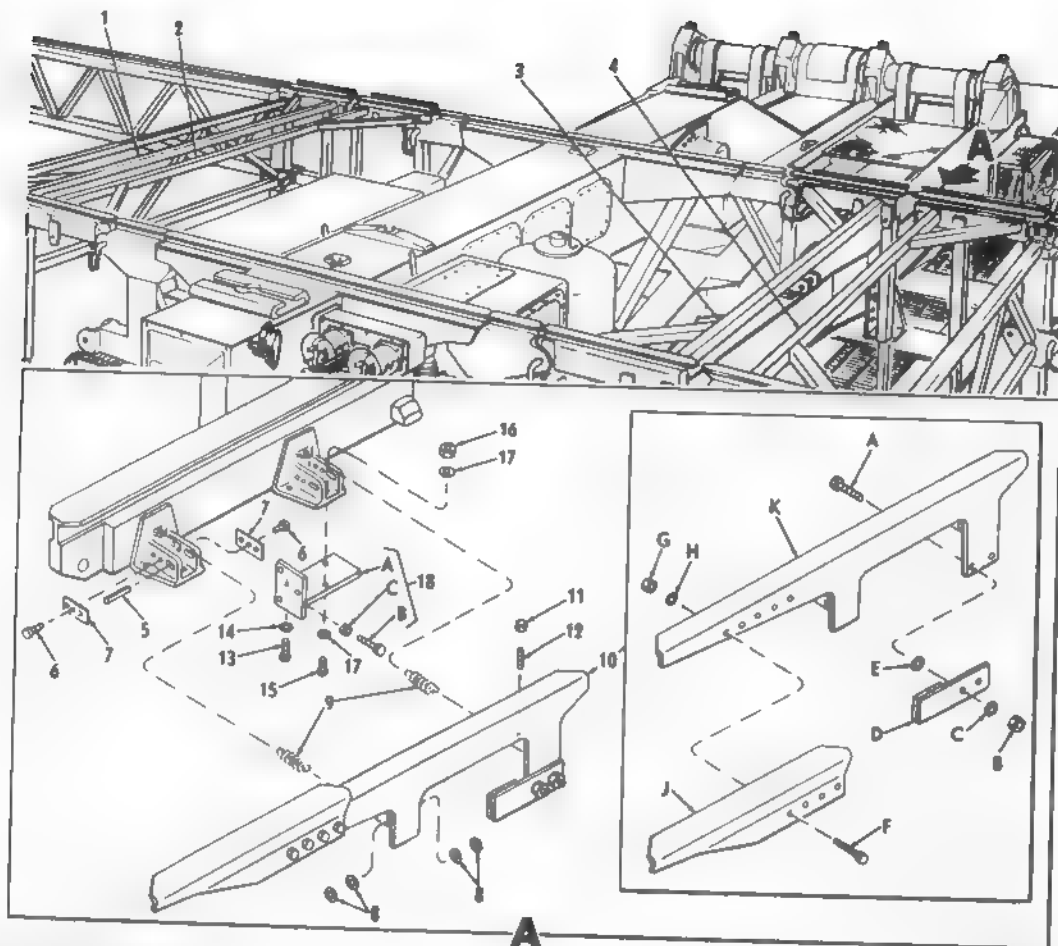
tribution box assembly and launcher base assembly.

- (c) *Hercules monorail launcher assembly No. 3.* Disconnect cable assemblies from receptacle connectors (A, B, C, D, and F, fig. 271) on power distribution box assembly and launcher base assembly.
 - (d) *Hercules monorail launcher assembly No. 4.* Disconnect cable assemblies from receptacle connectors (A, B, C, D, F, fig. 271) on power distribution box assembly and launcher base assembly.
 - (5) Remove the rail section assemblies (1 through 4, fig. 289.23) or remove the side truss assemblies (fig. 289).
 - (6) Using a hoisting device capable of lifting a minimum of 12,500 pounds, attach multiple leg slings (fig. 287) to lifting hook, and raise the launcher assembly clear of the anchor bolts.
 - (7) Remove the front, intermediate, or rear mounting brackets (fig. 288), as required.
- b. Installation.**

- (1) Install the front, intermediate or rear mounting brackets (fig. 288), as required.
- (2) Lower the Hercules monorail launcher assembly over anchor bolts (fig. 287).
- (3) Level the launcher assembly as described in TM 9-1440-250-20/1.
- (4) Position and install the rail section assemblies (1 through 4, fig. 289.23)

or position and install the side truss assemblies (fig. 289).

- (5) Secure mounting brackets (fig. 287) to anchor bolts.
- (6) Release toggle pins at intermediate lifting lugs and remove slings.
- (7) Connect cable assemblies to launcher assembly No. 1, No. 2, or No. 3 as follows:
 - (a) *Hercules monorail launcher assembly No. 1.* Connect cable assemblies to J6A, J69C, J69B, and J81A receptacle connectors (B, C, D, and F, fig. 271) on power distribution box assembly and launcher base assembly.
 - (b) *Hercules monorail launcher assembly No. 2.* Connect cable assemblies to J6A, J69C, J69B, and J81A receptacle connectors (B, C, D, and F, fig. 271) on power distribution box assembly and launcher base assembly.
 - (c) *Hercules monorail launcher assembly No. 3.* Connect cable assemblies to J12A, J6A, J69C, J69B, and J81A receptacle connectors (A, B, C, D, and F, fig. 271) on power distribution box assembly and launcher base assembly.
 - (d) *Hercules monorail launcher assembly No. 4.* Connect cable assemblies to J12A, J6A, J69C, J69B, and J81A receptacle connectors (A, B, C, D, and F, fig. 271) on power distribution box assembly and launcher base assembly.



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|--|---------------------------------------|
| 1—Rail section assembly | G—5/16-24 self-lkg hex. nut (4) |
| 2—Rail section assembly | H—5/16 fl washer (4) |
| 3—Rail section assembly | J—Bracket |
| 4—Rail section assembly | K—Arm |
| 5—0.375 dia x 2.250 spg pin (2) | 11—No. 10-32 hex nut |
| 6—No. 10-32 x 0.463 self-lkg hex-hd bolt (4) | 12—No. 10-32 x 1 oval-pt setscrew (2) |
| 7—Bar 9978790 (4) | 13—No. 8-32 x 5/8 pan-hd screw (2) |
| 8—3/8 fl washer (8) | 14—No. 10 lockwasher (2) |
| 9—Spring | 15—No. 8-32 x 7/8 pan-hd screw |
| 10—Switch actuator arm | 16—No. 8-32 self-lkg hex nut |
| A—1/4-28 x 1 hex-hd capscREW | 17—No. 10 lockwasher |
| B—1/4-28 self-lkg hex nut (2) | 18—Switch mounting bracket |
| C—1/4 fl washer (2) | A—Tee |
| D—Arm | B—No. 10-32 x 1 hex-hd bolt |
| E—17/64-id x 7/8-od fl washer (as required) | C—No. 10-32 hex nut |
| F—5/16-24 x 0.937 hex-hd bolt (4) | |

Figure 289.23. Switch-actuator arm—removal, disassembly, assembly, and installation—typical.

- | | |
|--------------------------------------|--------------------------------------|
| 1—3/8-16 x 1 1/2 hex-hd capscREW (4) | 5—Inboard right rail section |
| 2—3/8 lockwasher (4) | 6—3/8-24 hex nut (4) |
| 3—Headless angle pin (4) | 7—3/8 lockwasher (4) |
| 4—Outboard right rail section | 8—3/8-24 x 2 3/4 hex-hd capscREW (4) |

Figure 289.24. HERCULES USARL rail section assembly—removal and installation—legend.

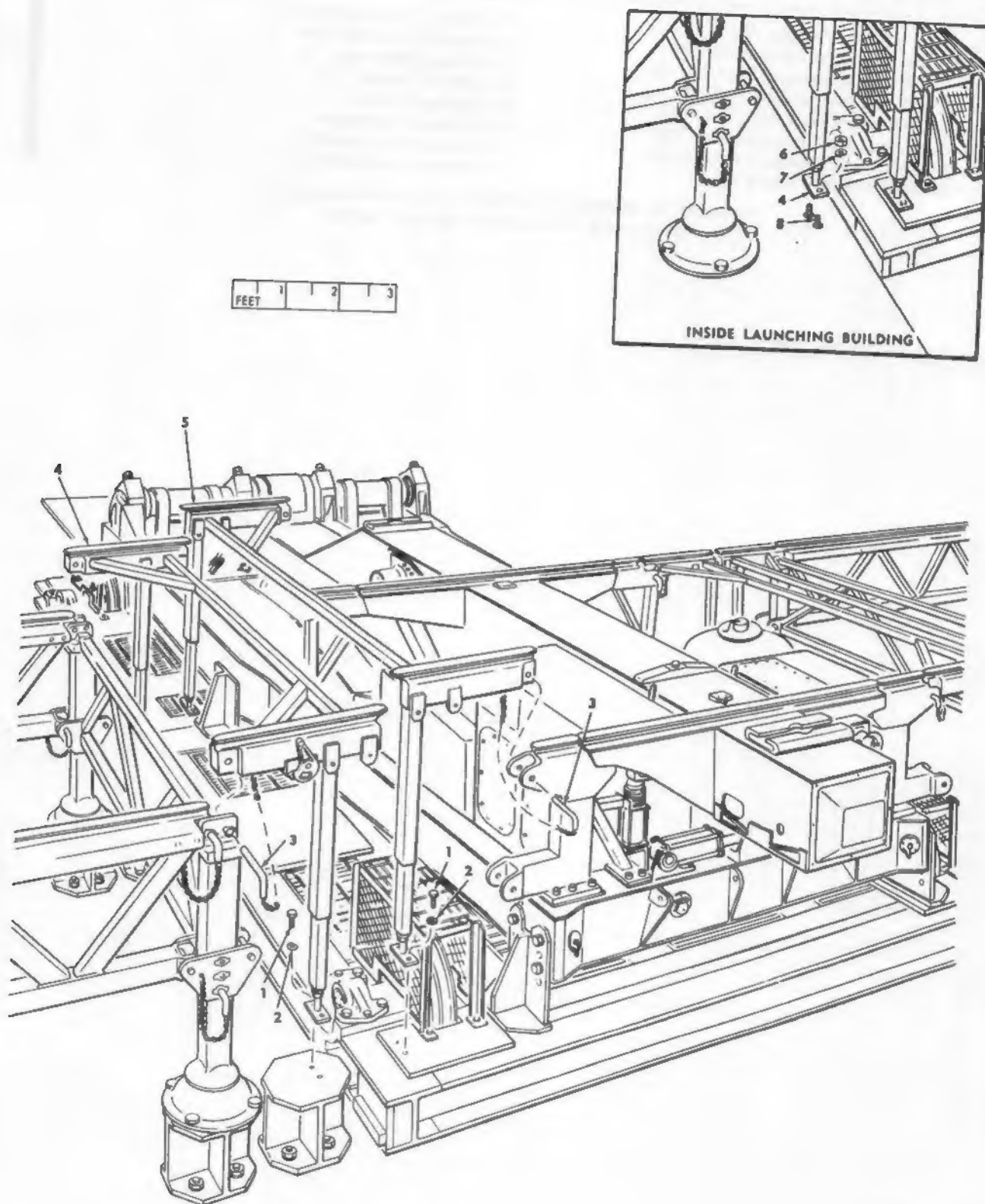


Figure 289.24. Hercules USARAL rail section assembly—removal and installation—Continued.

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|--|---------------------------|
| 1—3/8 x 1 3/8 spring pin (2) | 9—3/16 x 1 1/4 spring pin |
| 2—1-14 x 5 1/4, plain-head screw (2) | 10—Headless straight pin |
| 3—1/2-13 x 2 5/8 hexagon-head bolt (2) | 11—Missile dolly stop |
| 4—1/2-18 hexagon nut (4) | 12—3/8-24 hexagon nut |
| 5—1/2-inch lockwasher (4) | 13—Rubber bumper |
| 6—Loading-rack-adapter extension (2) | 14—3/8-inch lockwasher |
| 7—1/2-13 x 3 1/4 hexagon-head bolt (2) | 15—Rail section assembly |
| 8—Adapter assembly casing (2) | 16—Rail section assembly |

*Figure 289.25. HERCULES USARAL rail section assembly—
disassembly and assembly—typical—legend.*

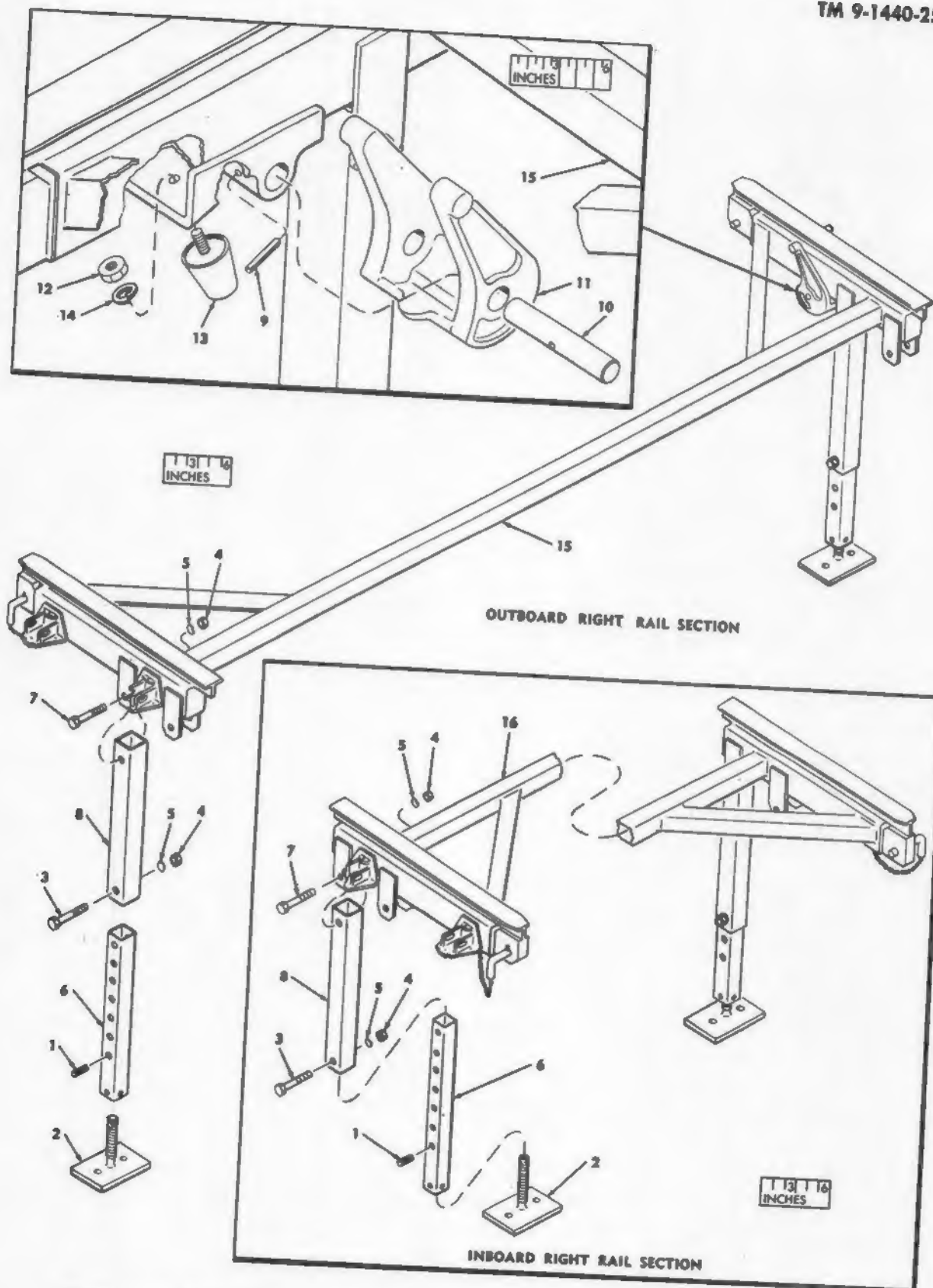


Figure 289.25. Hercules USARAL rail section assembly—disassembly and assembly—typical.

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